

IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the Application:

LISTING OF CLAIMS:

1. (Currently Amended) A circuit board module, comprising:
 - a circuit board having a component mounting location;
 - a circuit board component mounted to the component mounting location of the circuit board, the circuit board component including:
 - a substrate having non-conductive material and conductive material supported by the non-conductive material, the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface,
 - a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate, and
 - a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die, the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects

to a ground reference of the circuit board through the circuit board interface; and

a heat sink in thermal communication with the heat spreader of the circuit board component;

wherein the die is disposed between the heat spreader and the substrate, and

wherein the circuit board component is an Application Specific Integrated Circuit device, and

wherein the heat spreader comprises:

a primary portion extending along a flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate;

a secondary portion extending from the primary portion toward the substrate along a direction substantially perpendicular to the flat surface of the substrate, the secondary portion electrically contacting a conductive ground plane disposed along a flat surface of the substrate; and

a conductive ground edge extending from the secondary portion along a direction substantially perpendicular to the flat surface of the substrate and overhanging an outer periphery of the substrate, the conductive ground edge electrically coupled to a conductive ground edge portion of the heat spreader interface that extends along the outer periphery of the substrate.

2. (Currently Amended) The circuit board module of claim 1 wherein the heat spreader interface defined by the conductive material of the substrate of the circuit board component includes:

a the conductive ground plane disposed along a the flat surface of the substrate, the conductive ground plane completely encircling the die interface in a 360 degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

Claim 3 (Cancelled).

4. (Currently Amended) A circuit board module, comprising:
- a circuit board having a component mounting location;
 - a circuit board component mounted to the component mounting location of the circuit board, the circuit board component including:
 - a heat spreader configured to dissipate heat from the circuit board component,
 - a substrate having non-conductive material and conductive material supported by the non-conductive material, the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means for physically and electrically connecting to the heat spreader, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means, wherein the heat spreader and the heat spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface, and
 - a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate; and
 - a heat sink in thermal communication with the heat spreader of the circuit board component;
- wherein the die is disposed between the heat spreader and the substrate, and
- wherein the circuit board component is an Application Specific Integrated Circuit device, and
- wherein the heat spreader comprises:

a primary portion extending along a flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate;

a secondary portion extending from the primary portion toward the substrate along a direction substantially perpendicular to the flat surface of the substrate, the secondary portion electrically contacting a conductive ground plane disposed along a flat surface of the substrate; and

a conductive ground edge extending from the secondary portion along a direction substantially perpendicular to the flat surface of the substrate and overhanging an outer periphery of the substrate, the conductive ground edge electrically coupled to a conductive ground edge portion of the heat spreader connecting means that extends along the outer periphery of the substrate.

5. (Currently Amended) A circuit board component, comprising:

a substrate having non-conductive material and conductive material supported by the non-conductive material, the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface;

a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with a circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate; and

a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die, the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface;

wherein the die is disposed between the heat spreader and the substrate,
and

wherein the circuit board component is an Application Specific Integrated Circuit device, and

wherein the heat spreader comprises:

a primary portion extending along a flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate;

a secondary portion extending from the primary portion toward the substrate along a direction substantially perpendicular to the flat surface of the substrate, the secondary portion electrically contacting a conductive ground plane disposed along a flat surface of the substrate; and

a conductive ground edge extending from the secondary portion along a direction substantially perpendicular to the flat surface of the substrate and overhanging an outer periphery of the substrate, the conductive ground edge electrically coupled to a conductive ground edge portion of the heat spreader connecting means that extends along the outer periphery of the substrate.

6. (Currently Amended) The circuit board component of claim 5 wherein the heat spreader interface includes:

the a conductive ground plane disposed along the a flat surface of the substrate, the conductive ground plane completely encircling the die interface in a 360 degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

Claims 7 - 9 (Cancelled).

10. (Previously Presented) The circuit board component of claim 5 wherein the heat spreader interface includes:

conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner

to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

11. (Original) The circuit board component of claim 5, further comprising: a ring-shaped solder joint formed from high temperature solder which forms an electromagnetic interference seal between the heat spreader and the heat spreader interface defined by the conductive material of the substrate.

12. (Original) The circuit board component of claim 5 wherein the heat spreader interface is disposed along a first flat surface of the substrate, wherein the circuit board interface is disposed along a second flat surface of the substrate, wherein the first and second flat surfaces are substantially parallel to each other, wherein the circuit board interface includes an array of pads, and wherein the circuit board component further comprises:

an array of circuit board contacts coupled to the array of pads, the array of circuit board contacts being configured to mount to an area array component mounting location of the circuit board using a surface mount technology soldering process.

Claim 13 (Cancelled).

14. (Currently Amended) A circuit board component, comprising:

a heat spreader configured to dissipate heat from the circuit board component;

a substrate having non-conductive material and conductive material supported by the non-conductive material, the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means for physically and electrically connecting to the heat spreader, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means, wherein the heat spreader and the heat

-8-

spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of a circuit board through the circuit board interface; and

a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate;

wherein the die is disposed between the heat spreader and the substrate, and

wherein the circuit board component is an Application Specific Integrated Circuit device, and

wherein the heat spreader comprises:

a primary portion extending along a flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate;

a secondary portion extending from the primary portion toward the substrate along a direction substantially perpendicular to the flat surface of the substrate, the secondary portion electrically contacting a conductive ground plane disposed along a flat surface of the substrate; and

a conductive ground edge extending from the secondary portion along a direction substantially perpendicular to the flat surface of the substrate and overhanging an outer periphery of the substrate, the conductive ground edge electrically coupled to a conductive ground edge portion of the heat spreader connecting means that extends along the outer periphery of the substrate.

15. (Previously Presented) The circuit board component of claim 14 wherein the heat spreader interface defined by the conductive material of the substrate includes:

a conductive ground plane disposed along a flat surface of the substrate, the conductive ground plane completely encircling the die interface in a 360

degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

16. (Previously Presented) The circuit board component of claim 14 wherein the heat spreader interface defined by the conductive material of the substrate includes:

conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

Claims 17- 20 (Cancelled).

21. (Previously Presented) The circuit board module of claim 3, wherein the conductive ground plates disposed along the flat surface of the substrate define a separation distance between adjacent conductive ground plates.

22. (Previously Presented) The circuit board module of claim 21, wherein the separation distance is less than one-half a length of an electromagnetic wave.

23. (Previously Presented) The circuit board component of claim 10, wherein the conductive ground plates disposed along the flat surface of the substrate define a separation distance between adjacent conductive ground plates.

24. (Previously Presented) The circuit board component of claim 23, wherein the separation distance is less than one-half a length of an electromagnetic wave.

25. (Previously Presented) The circuit board component of claim 16, wherein the conductive ground plates disposed along the flat surface of the substrate define a separation distance between adjacent conductive ground plates.

26. (Previously Presented) The circuit board component of claim 25, wherein the separation distance is less than one-half a length of an electromagnetic wave.

27. (Previously Presented) The circuit board module of claim 4 wherein the heat spreader interface defined by the conductive material of the substrate of the circuit board component includes:

conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry.

28. (Previously Presented) The circuit board module of claim 27, wherein the conductive ground plates disposed along the flat surface of the substrate define a separation distance between adjacent conductive ground plates.

29. (Previously Presented) The circuit board module of claim 1, wherein:
the conductive material comprises at least one conductive layer; and
the non-conductive material comprises a non-conductive layer supported by the conductive layer.

Claims 30 - 35 (Cancelled).

36. (New) A circuit board module, comprising:
a circuit board having a component mounting location;

a circuit board component mounted to the component mounting location of the circuit board, the circuit board component including:

a substrate having non-conductive material and conductive material supported by the non-conductive material, the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface,

a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate, and

a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die, the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface; and

a heat sink in thermal communication with the heat spreader of the circuit board component;

wherein the die is disposed between the heat spreader and the substrate, and

wherein the circuit board component is an Application Specific Integrated Circuit device,

wherein the heat spreader interface defined by the conductive material of the substrate of the circuit board component includes:

conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner to minimize escape of electromagnetic interference from the die during operation of the integrated circuitry,

wherein the heat spreader comprises:

a primary portion extending along the flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate; and

a secondary portion extending from the primary portion toward the substrate along a direction substantially perpendicular to the flat surface of the substrate, the secondary portion electrically contacting a conductive ground plane disposed along a flat surface of the substrate, and further comprising:

a conductive ground edge extending from the secondary portion along a direction substantially perpendicular to the flat surface of the substrate and overhanging an outer periphery of the substrate, the conductive ground edge electrically coupled to a conductive ground edge portion of the heat spreader interface that extends along the outer periphery of the substrate.